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Technique for automatically correcting words in text

Author   Karen Kukich Bellcore, Morristown, NJ

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↑ ABSTRACT

Research aimed at correcting words in text has focused on three progressively more difficult problems:(1) nonword error detection; (2) isolated-word error correction; and (3) context-dependent work correction. In response to the first problem, efficient pattern-matching and n-gram analysis techniques have been developed for detecting strings that do not appear in a given word list. In response to the second problem, a variety of general and application-specific spelling correction techniques have been developed. Some of them were based on detailed studies of spelling error patterns. In response to the third problem, a few experiments using natural-language-processing tools or statistical-language models have been carried out. This article surveys documented findings on spelling error patterns, provides descriptions of various nonword detection and isolated-word error correction techniques, reviews the state of the art of context-dependent word correction techniques, and discusses research issues related to all three areas of automatic error correction in text.

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↑ **INDEX TERMS**

Primary Classification:
I. Computing Methodologies
↳ **I.2** ARTIFICIAL INTELLIGENCE
↳ **I.2.7** Natural Language Processing
↳ **Subjects:** Text analysis

Additional Classification:
I. Computing Methodologies
↳ **I.2** ARTIFICIAL INTELLIGENCE
↳ **I.2.7** Natural Language Processing
↳ **Subjects:** Language models; Language parsing and understanding
↳ **I.5** PATTERN RECOGNITION
↳ **I.5.1** Models
↳ **Subjects:** Statistical; Neural nets
↳ **I.7** DOCUMENT AND TEXT PROCESSING
↳ **I.7.1** Document and Text Editing

↳ **Subjects:** Spelling**

General Terms:
Algorithms, Experimentation, Human Factors, Performance, Theory

Keywords:
n-gram analysis, Optical Character Recognition (OCR), context-dependent spelling correction, grammar checking, natural-language-processing models, neural net classifiers, spell checking, spelling error detection, spelling error patterns, statistical-language models, word recognition and correction

↑ **REVIEW**

"Graeme J. Hirst"

It is often easy to tell when a poor speller or poor typist has used a spelling checker on a document: each word is correctly spelled, but not all are the words that the author intended. And optical character recognition of documents, with its occasional misrecognitions, has given the world a whole new source of spelling errors. Although spelling checkers (sometimes called "spell checkers" by people who need syntax checkers) have been available for many years now, there is still much room for improvement. In this paper, Kukich presents a careful and exhaustive survey of the techniques— many of them fascinating and ingenious—that have been developed for efficiently finding and correcting errors in spelling; she summarizes each method and its strengths and weaknesses. The problem divides into two parts: detecting an error, which might be a non-word or a wrong real word; and correcting such errors, either in isolation or in context. Non-word detection is the easiest form of the problem, and so the simplest spelling checkers are those that merely draw the user's attention to suspect words. The main techniques used are n-gram probabilities (for example, the trigram fkh has zero chance of occurring in an English word) and lexicons of correctly spelled words (which must be neither too big nor too small). Kukich finds the former better for detecting OCR errors, the latter better for human typing. To correct the possible error, once it is found, a set of candidate corrections must be generated and ranked. These may be presented to the user for the final judgment, or the substitution may be automatic. Kukich reviews a wide variety of methods—including minimum edit distance, similarity keys, the Viterbi algorithm, and neural nets—but finds none wholly satisfactory; in particular, neural nets, which might have been thought to be ideally suited to a problem of this kind, require a prohibitive amount of training. The hardest form of the problem is the detection and correction of erroneous real words, which generally requires some linguistic knowledge (and, in the worst case, a complete understanding of the meaning of the text). For example, a parser can determine when a real-word error causes a syntax error in the sentence; this technique is the basis for many grammar-based writer's aids, such as CRITIQUE [1]. Word bigram or trigram probabilities, derived from large text corpora, can improve other techniques. Because it admits so many different kinds of approaches, spelling checking is a problem that attracts an audience from many different subfields of computing. Despite much effort and many clever ideas, it remains far from solved. Kukich's review will become the definitive reference for work done up to this point; any computer scientist will enjoy reading it. *Online Computing Reviews Service*

↑ **Collaborative Colleagues:**
    Karen Kukich: Kathleen McKeown
                        Jacques Robin

↑ **Peer to Peer - Readers f this Article have also read:**
  • Data structures for quadtree approximation and compression
    Communications of the ACM 28, 9

Hanan Samet

- MBONE: the multicast backbone
  Communications f the ACM   37, 8
  Hans Eriksson

- Dynamic initial allocation and local reallocation procedures for multiple stacks
  Communications of the ACM   29, 2
  D. Yun Yeh , Toshinori Munakata

- An Overview of the Theory of Computational Complexity
  Journal of the ACM (JACM)   18, 3
  J. Hartmanis , J. E. Hopcroft

- The state of the art in automating usability evaluation of user interfaces
  ACM Computing Surveys (CSUR)   33, 4
  Melody Y. Ivory , Marti A Hearst

Refine Search

Search Results -

Terms	Documents
L7 and metric and vector$2 and signal$2 and learn$4 and probabil$6 and correlation and matrix	4

Database:

US Pre-Grant Publication Full-Text Database
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EPO Abstracts Database
JPO Abstracts Database
Derwent World Patents Index
IBM Technical Disclosure Bulletins

Search:

L8

[Refine Search]

[Recall Text] [Clear] [Interrupt]

Search History

DATE: Tuesday, December 30, 2003   Printable Copy   Create Case

Set Name side by side	Query	Hit Count	Set Name result set
	DB=PGPB,USPT,USOC,EPAB,JPAB,DWPI,TDBD; PLUR=NO; OP=OR		
L8	L7 and metric and vector$2 and signal$2 and learn$4 and probabil$6 and correlation and matrix	4	L8
L7	706/45.ccls.	621	L7
L6	L5 and keyword	29	L6
L5	metric and vector$2 and signal$2 and learn$4 and probabil$6 and correlation and matrix	240	L5
L4	L1 and metric and vector$2 and signal$2 and learn$4 and probabil$6 and correlation and matrix	7	L4
L3	L2 and probabil$6 and correlation	7	L3
L2	L1 and metric and vector$2 and signal$2 and learn$4	32	L2
L1	706/25.ccls.	795	L1

END OF SEARCH HISTORY

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Search Results -

Terms	Documents
L10 and keyword	11

Database:

US Pre-Grant Publication Full-Text Database
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Search:

L11

Refine Search

Recall Text   Clear   Interrupt

Search History

DATE: Tuesday, December 30, 2003   Printable Copy   Create Case
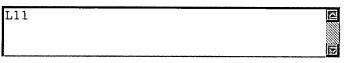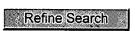
Set Name side by side	Query	Hit Count	Set Name result set
DB=PGPB,USPT,USOC,EPAB,JPAB,DWPI,TDBD; PLUR=NO; OP=OR			
L11	L10 and keyword	11	L11
L10	L9 and measure	378	L10
L9	quantitative and vector$2 and signal$2 and learn$4 and probabil$6 and correlation and matrix	431	L9
L8	L7 and metric and vector$2 and signal$2 and learn$4 and probabil$6 and correlation and matrix	4	L8
L7	706/45.ccls.	621	L7
L6	L5 and keyword	29	L6
L5	metric and vector$2 and signal$2 and learn$4 and probabil$6 and correlation and matrix	240	L5
L4	L1 and metric and vector$2 and signal$2 and learn$4 and probabil$6 and correlation and matrix	7	L4
L3	L2 and probabil$6 and correlation	7	L3

| L2 | L1 and metric and vector$2 and signal$2 and learn$4 | 32 | L2 |
| L1 | 706/25.ccls. | 795 | L1 |

END OF SEARCH HISTORY

Hit List

Search Results - Record(s) 1 through 11 of 11 returned.

☐ 1. Document ID: US 20030182246 A1

L11: Entry 1 of 11   File: PGPB   Sep 25, 2003

PGPUB-DOCUMENT-NUMBER: 20030182246
PGPUB-FILING-TYPE: new
DOCUMENT-IDENTIFIER: US 20030182246 A1

TITLE: Applications of fractal and/or chaotic techniques

PUBLICATION-DATE: September 25, 2003

INVENTOR-INFORMATION:

NAME	CITY	STATE	COUNTRY	RULE-47
Johnson, William Nevil Heaton	St. Peter Port		GB	
Blackledge, Jonathan Michael	Leicester		GB	
Murray, Bruce Lawrence John	Barcombe		GB	

US-CL-CURRENT: <u>705/76</u>; <u>380/201</u>, <u>380/278</u>

| Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw De |

☐ 2. Document ID: US 20030172043 A1

L11: Entry 2 of 11   File: PGPB   Sep 11, 2003

PGPUB-DOCUMENT-NUMBER: 20030172043
PGPUB-FILING-TYPE: new
DOCUMENT-IDENTIFIER: US 20030172043 A1

TITLE: Methods of identifying patterns in biological systems and uses thereof

PUBLICATION-DATE: September 11, 2003

INVENTOR-INFORMATION:

NAME	CITY	STATE	COUNTRY	RULE-47
Guyon, Isabelle	Berkeley	CA	US	
Weston, Jason	St. Leonard's on Sea		GB	

US-CL-CURRENT: <u>706/48</u>

| Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw D |

☐   3.   Document ID: US 20030162219 A1

L11: Entry 3 of 11   File: PGPB   Aug 28, 2003

PGPUB-DOCUMENT-NUMBER: 20030162219
PGPUB-FILING-TYPE: new
DOCUMENT-IDENTIFIER: US 20030162219 A1

TITLE: Methods for predicting functional and structural properties of polypeptides
using sequence models

PUBLICATION-DATE: August 28, 2003

INVENTOR-INFORMATION:

NAME	CITY	STATE	COUNTRY	RULE-47
Sem, Daniel S.	San Diego	CA	US	
Baker, Brian	Poway	CA	US	
Hansen, Mark R.	San Diego	CA	US	

US-CL-CURRENT: 435/7.1; 702/19

| Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw D |

☐   4.   Document ID: US 20020156763 A1

L11: Entry 4 of 11   File: PGPB   Oct 24, 2002

PGPUB-DOCUMENT-NUMBER: 20020156763
PGPUB-FILING-TYPE: new
DOCUMENT-IDENTIFIER: US 20020156763 A1

TITLE: Extended functionality for an inverse inference engine based web search

PUBLICATION-DATE: October 24, 2002

INVENTOR-INFORMATION:

NAME	CITY	STATE	COUNTRY	RULE-47
Marchisio, Giovanni B.	Kirkland	WA	US	

US-CL-CURRENT: 707/1

| Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw D |

☐   5.   Document ID: US 20020151992 A1

L11: Entry 5 of 11   File: PGPB   Oct 17, 2002

PGPUB-DOCUMENT-NUMBER: 20020151992
PGPUB-FILING-TYPE: new
DOCUMENT-IDENTIFIER: US 20020151992 A1

TITLE: Media recording device with packet data interface

PUBLICATION-DATE: October 17, 2002

INVENTOR-INFORMATION:

NAME	CITY	STATE	COUNTRY	RULE-47
Hoffberg, Steven M.	West Harrison	NY	US	
Hoffberg-Borghesani, Linda I.	Acton	MA	US	

US-CL-CURRENT: <u>700</u>/<u>83</u>; <u>700</u>/<u>17</u>, <u>700</u>/<u>18</u>, <u>700</u>/<u>86</u>, <u>700</u>/<u>87</u>

Full	Title	Citation	Front	Review	Classification	Date	Reference	Sequences	Attachments	Claims	KWIC	Draw D

☐ 6.   Document ID: US 20020069218 A1

L11: Entry 6 of 11   File: PGPB   Jun 6, 2002

PGPUB-DOCUMENT-NUMBER: 20020069218
PGPUB-FILING-TYPE: new
DOCUMENT-IDENTIFIER: US 20020069218 A1

TITLE: System and method for indexing, searching, identifying, and editing portions of electronic multimedia files

PUBLICATION-DATE: June 6, 2002

INVENTOR-INFORMATION:

NAME	CITY	STATE	COUNTRY	RULE-47
Sull, Sanghoon	Seoul		KR	
Kim, Hyeokman	Seoul		KR	
Choi, Hyungseok	Seoul		KR	
Chung, Min Gyo	Sungnam City		KR	
Yoon, Ja-Cheon	Seoul		KR	
Oh, Jeongtaek	Seoul		KR	
Lee, Sangwook	Seoul		KR	
Song, S. Moon-Ho	Seoul		KR	
Kim, Jung Rim	Seoul		KR	
Lee, Keansub	Suwon City		KR	
Chun, Seong Soo	Songnam City		KR	
Oh, Sangwook	Cheju City		KR	
Kim, Yunam	Cheju City		KR	

US-CL-CURRENT: <u>715</u>/<u>501.1</u>

Full	Title	Citation	Front	Review	Classification	Date	Reference	Sequences	Attachments	Claims	KWIC	Draw D

☐ 7.   Document ID: US 6640145 B2

L11: Entry 7 of 11   File: USPT   Oct 28, 2003

US-PAT-NO: 6640145
DOCUMENT-IDENTIFIER: US 6640145 B2

TITLE: Media recording device with packet data interface

DATE-ISSUED: October 28, 2003

INVENTOR-INFORMATION:
NAME	CITY	STATE	ZIP CODE	COUNTRY
Hoffberg; Steven	West Harrison	NY	10604	
Hoffberg-Borghesani; Linda	Acton	MA	01720	

US-CL-CURRENT: 700/83; 700/17, 700/19, 700/23, 704/200, 704/201, 704/7, 709/200, 709/201, 709/202

| Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw De |

☐ 8.   Document ID: US 6400996 B1

L11: Entry 8 of 11   File: USPT   Jun 4, 2002

US-PAT-NO: 6400996
DOCUMENT-IDENTIFIER: US 6400996 B1

TITLE: Adaptive pattern recognition based control system and method

DATE-ISSUED: June 4, 2002

INVENTOR-INFORMATION:
NAME	CITY	STATE	ZIP CODE	COUNTRY
Hoffberg; Steven M.	West Harrison	NY	10994	
Hoffberg-Borghesani; Linda I.	Acton	MA	01720	

US-CL-CURRENT: 700/83; 345/810, 345/840, 345/841, 370/218, 370/355, 700/17, 700/24, 700/25, 700/86, 700/87, 709/102, 709/223, 709/227, 709/318

| Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw De |

☐ 9.   Document ID: US 6341372 B1

L11: Entry 9 of 11   File: USPT   Jan 22, 2002

US-PAT-NO: 6341372
DOCUMENT-IDENTIFIER: US 6341372 B1

TITLE: Universal machine translator of arbitrary languages

DATE-ISSUED: January 22, 2002

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Datig; William E.	Centerport	NY	11721	

US-CL-CURRENT: 717/136; 715/523

| Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw De |

☐   10.   Document ID: US 6233545 B1

L11: Entry 10 of 11   File: USPT   May 15, 2001

US-PAT-NO: 6233545
DOCUMENT-IDENTIFIER: US 6233545 B1

TITLE: Universal machine translator of arbitrary languages utilizing epistemic moments

DATE-ISSUED: May 15, 2001

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Datig; William E.	Centerport	NY	11721	

US-CL-CURRENT: 704/2; 704/9, 706/62

| Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw De |

☐   11.   Document ID: US 5544256 A

L11: Entry 11 of 11   File: USPT   Aug 6, 1996

US-PAT-NO: 5544256
DOCUMENT-IDENTIFIER: US 5544256 A
** See image for **Certificate of Correction** **

TITLE: Automated defect classification system

DATE-ISSUED: August 6, 1996

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Brecher; Virginia H.	West Cornwall	CT		
Chou; Paul B.-L,	Montvale	NJ		
Hall; Robert W.	Jericho	VT		
Parisi; Debra M.	Carmel	NY		
Rao; Ravishankar	White Plains	NY		
Riley; Stuart L.	Colchester	VT		

Sturzenbecker; Martin C.   Carmel   NY

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1 Session 9: image indexing and retrieval: DynDex: a dynamic and non-metric space indexer   ■
King-Shy Goh, Beitao Li, Edward Chang
December 2002 **Proceedings of the tenth ACM international conference on Multimedia**
Full text available: 📄 pdf(648.47 KB)   Additional Information: full citation, abstract, references, citings

> To date, almost all research work in the Content-Based Image Retrieval (CBIR) community has used Minkowski-like functions to measure similarity between images. In this paper, we first present a non-metric distance function, dynamic partial function (DPF), which works significantly better than Minkowski-like functions for measuring perceptual similarity; and we explain DPF's link to similarity theories in cognitive science. We then propose DynDex, an indexing method that deals with both the dynam ...
>
> **Keywords**: high-dimensional index, non-metric distance function, similarity search

2 Video Processing: Multimedia edges: finding hierarchy in all dimensions   ■
Malcolm Slaney, Dulce Ponceleon, James Kaufman
October 2001 **Proceedings of the ninth ACM international conference on Multimedia**
Full text available: 📄 pdf(6.41 MB)   Additional Information: full citation, abstract, references

> This paper describes a new unified representation for the informaction in a video. We reduce the dimensionality of the signal with either a singular-value decomposition (on the semantic and image data) or mel-frequency cepstral coefficients (on the audio data) and then concatenate the vectors to form a multi-dimensional represenctation of the video. Using scale-space techniques we find large jumps in the video's path, which we call edges. We use these techcniques to analyze the temporal properti ...
>
> **Keywords**: audio, automatic segmentation, color space, hierarchy, images, latent semantic indexing, multimedia, video, scale space, semantic space, singular-value decomposition, temporal properties

3 Picture Processing by Computer   ■
Azriel Rosenfeld
September 1969 **ACM Computing Surveys (CSUR)**, Volume 1 Issue 3

Full text available: ⬚ pdf(2.69 MB)   Additional Information: <u>full citation</u>, <u>references</u>, <u>citings</u>, <u>index terms</u>

4 <u>Speech and gaze: A multimodal learning interface for grounding spoken language in sensory perceptions</u>

Chen Yu, Dana H. Ballard

November 2003 **Proceedings of the 5th international conference on Multimodal interfaces**

Full text available: ⬚ pdf(849.56 KB)   Additional Information: <u>full citation</u>, <u>abstract</u>, <u>references</u>, <u>index terms</u>

Most speech interfaces are based on natural language processing techniques that use pre-defined symbolic representations of word meanings and process only linguistic information. To understand and use language like their human counterparts in multimodal human-computer interaction, computers need to acquire spoken language and map it to other sensory perceptions. This paper presents a multimodal interface that learns to associate spoken language with perceptual features by being situated in users ...

Keywords: language acquisition, machine learning, multimodal integration

5 <u>Clustered principal components for precomputed radiance transfer</u>

Peter-Pike Sloan, Jesse Hall, John Hart, John Snyder

July 2003 **ACM Transactions on Graphics (TOG)**, Volume 22 Issue 3

Full text available: ⬚ pdf(9.29 MB)   Additional Information: <u>full citation</u>, <u>abstract</u>, <u>references</u>

We compress storage and accelerate performance of precomputed radiance transfer (PRT), which captures the way an object shadows, scatters, and reflects light. PRT records over many surface points a transfer matrix. At run-time, this matrix transforms a vector of spherical harmonic coefficients representing distant, low-frequency source lighting into exiting radiance. Per-point transfer matrices form a high-dimensional surface signal that we compress using *clustered principal component analysi* ...

Keywords: *graphics hardware, illumination, monte carlo techniques, rendering, shadow algorithms*

6 <u>Three-dimensional object recognition</u>

Paul J. Besl, Ramesh C. Jain

March 1985 **ACM Computing Surveys (CSUR)**, Volume 17 Issue 1

Full text available: ⬚ pdf(7.76 MB)   Additional Information: <u>full citation</u>, <u>abstract</u>, <u>references</u>, <u>citings</u>, <u>index terms</u>, <u>review</u>

A general-purpose computer vision system must be capable of recognizing three-dimensional (3-D) objects. This paper proposes a precise definition of the 3-D object recognition problem, discusses basic concepts associated with this problem, and reviews the relevant literature. Because range images (or depth maps) are often used as sensor input instead of intensity images, techniques for obtaining, processing, and characterizing range data are also surveyed.

7 <u>Towards the ultimate APL-TOE</u>

Gérard A. Langlet

July 1992 **ACM SIGAPL APL Qu te Quad , Proceedings of the international conference on APL**, Volume 23 Issue 1

Full text available: ⬚ pdf(1.69 MB)   Additional Information: <u>full citation</u>, <u>abstract</u>, <u>references</u>, <u>citings</u>, <u>index terms</u>

This paper presents the results of more than 10 years of transdisciplinary work. The initial idea was: can the laws of Nature also been found of rebuilt, independently from theoretical research in Physics (on elementary particles and matter in general), also in the field of Computer Science i.e. Information Processing? Pressing a lemon reveals its juice and stones; if one "tortures" matter, the components of its (first electrons, neutrons and protons, then quarks and gluons at a ...

Keywords: APL, Fibonacci, T.O.E., automata, binary algebra, chaos, dynamical systems, fractals, genetics, holography, integrals, parity, periodic systems, propagation, symmetry, topology

8 Computational strategies for object recognition

Paul Suetens, Pascal Fua, Andrew J. Hanson
March 1992 **ACM Computing Surveys (CSUR)**, Volume 24 Issue 1

Full text available: pdf(6.37 MB)   Additional Information: full citation, abstract, references, citings, index terms, review

This article reviews the available methods for automated identification of objects in digital images. The techniques are classified into groups according to the nature of the computational strategy used. Four classes are proposed: (1) the simplest strategies, which work on data appropriate for feature vector classification, (2) methods that match models to symbolic data structures for situations involving reliable data and complex models, (3) approaches that fit models to the photometry and ...

Keywords: image understanding, model-based vision, object recognition

9 Computing curricula 2001

September 2001 **Journal on Educational Resources in Computing (JERIC)**

Full text available: pdf(613.63 KB)
html(2.78 KB)   Additional Information: full citation, references, citings, index terms

10 A survey of methods for recovering quadrics in triangle meshes

Sylvain Petitjean
June 2002 **ACM Computing Surveys (CSUR)**, Volume 34 Issue 2

Full text available: pdf(3.91 MB)   Additional Information: full citation, abstract, references, index terms

In a variety of practical situations such as reverse engineering of boundary representation from depth maps of scanned objects, range data analysis, model-based recognition and algebraic surface design, there is a need to recover the shape of visible surfaces of a dense 3D point set. In particular, it is desirable to identify and fit simple surfaces of known type wherever these are in reasonable agreement with the data. We are interested in the class of quadric surfaces, that is, algebraic surfa ...

Keywords: Data fitting, geometry enhancement, local geometry estimation, mesh fairing, shape recovery

11 Research track: Visualizing changes in the structure of data for exploratory feature selection

Elias Pampalk, Werner Goebl, Gerhard Widmer
August 2003 **Proceedings of the ninth ACM SIGKDD international conference on Knowledge discovery and data mining**

Full text available: 📄 pdf(642.44 KB)   Additional Information: full citation, abstract, references, index terms

Using visualization techniques to explore and understand high-dimensional data is an efficient way to combine human intelligence with the immense brute force computation power available nowadays. Several visualization techniques have been developed to study the cluster structure of data, i.e., the existence of distinctive groups in the data and how these clusters are related to each other. However, only few of these techniques lend themselves to studying how this structure changes if the feature ...

Keywords: high-dimensional data, interactive data mining

12 Progress in Picture Processing: 1969--71
Azriel Rosenfeld
June 1973 **ACM Computing Surveys (CSUR)**, Volume 5 Issue 2
Full text available: 📄 pdf(2.34 MB)   Additional Information: full citation, references, citings, index terms

13 The principled design of large-scale recursive neural network architectures--dag-rnns and the protein structure prediction problem
Pierre Baldi, Gianluca Pollastri
September 2003 **The Journal of Machine Learning Research**, Volume 4
Full text available: 📄 pdf(231.40 KB)   Additional Information: full citation, abstract

We describe a general methodology for the design of large-scale recursive neural network architectures (DAG-RNNs) which comprises three fundamental steps: (1) representation of a given domain using suitable directed acyclic graphs (DAGs) to connect visible and hidden node variables; (2) parameterization of the relationship between each variable and its parent variables by feedforward neural networks; and (3) application of weight-sharing within appropriate subsets of DAG connections to capture s ...

14 Partial-order transport service for multimedia and other applications
Paul D. Amer, Christophe Chassot, Thomas J. Connolly, Michel Diaz, Phillip Conrad
October 1994 **IEEE/ACM Transactions on Networking (TON)**, Volume 2 Issue 5
Full text available: 📄 pdf(1.56 MB)   Additional Information: full citation, references, citings, index terms

15 Optimal communication algorithms for regular decompositions on the hypercube
G. C. Fox, W. Furmanski
January 1988 **Proceedings of the third conference on Hypercube concurrent computers and applications: Architecture, software, computer systems, and general issues - Volume 1**
Full text available: 📄 pdf(4.81 MB)   Additional Information: full citation, abstract, references, citings, index terms

We discuss optimal communication and decomposition algorithms for a class of regular problems on concurrent computers with a hypercube topology, using a general technique we call the method of cube geodesics. We address the calculation of various transformations (convolutions, functionals etc.) of data distributed over the hypercube; examples are the Fast Fourier Transform, matrix algorithms, global scalar products and vector sums, sorting. These all involve long distance inter ...

16 The visual display of information in an information retrieval environment
Donald B. Crouch

September 1986 **Proceedings of the 9th annual international ACM SIGIR conference on Research and development in information retrieval**
Full text available: 🔁 pdf(893.49 KB)   Additional Information: full citation, abstract, references, citings

This paper gives an overview of the graphical techniques which have been used in the representation of information in a document collection environment. An assessment of the applicability of existing multivariate data graphical techniques to the vector space model is presented.

17 Load balancing loosely synchronous problems with a neural network   ▪
G. C. Fox, W. Furmanski
January 1988 **Proceedings of the third conference on Hypercube concurrent computers and applications: Architecture, software, computer systems, and general issues - Volume 1**

Full text available: 🔁 pdf(2.90 MB)   Additional Information: full citation, abstract, references, citings, index terms

Hopfield and Tank have introduced the use of neural networks for the solution of optimization problems such as the traveling salesman problem. Here we show how to generalize this method to decompose loosely synchronous problems onto parallel machines and in particular the hypercube. In this case, decomposition or load balancing can be formulated graph theoretically in terms of optimal partitioning of the computational graph into N = 2

18 Authoritative sources in a hyperlinked environment   ▪
Jon M. Kleinberg
September 1999 **Journal of the ACM (JACM)**, Volume 46 Issue 5

Full text available: 🔁 pdf(195.41 KB)   Additional Information: full citation, abstract, references, citings, index terms, review

The network structure of a hyperlinked environment can be a rich source of information about the content of the environment, provided we have effective means for understanding it. We develop a set of algorithmic tools for extracting information from the link structures of such environments, and report on experiments that demonstrate their effectiveness in a variety of context on the World Wide Web. The central issue we address within our framework is the distillation of broad search topics, ...

Keywords: World Wide Web, graph algorithms, hypertext structure, link analysis

19 MessageWorld: a new approach to facilitating asynchronous group communication   ▪
Daniel E. Rose, Jeremy J. Bornstein, Kevin Tiene
December 1995 **Proceedings of the fourth international conference on Information and knowledge management**
Full text available: 🔁 pdf(1.04 MB)   Additional Information: full citation, references, citings, index terms

20 Kernel independent component analysis   ▪
Francis R. Bach, Michael I. Jordan
March 2003 **The Journal of Machine Learning Research**, Volume 3

Full text available: 🔁 pdf(561.46 KB)   Additional Information: full citation, abstract, references, citings, index terms

We present a class of algorithms for independent component analysis (ICA) which use contrast functions based on canonical correlations in a reproducing kernel Hilbert space. On the one hand, we show that our contrast functions are related to mutual information and have desirable mathematical properties as measures of statistical dependence. On the other

hand, building on recent developments in kernel methods, we show that these criteria and their derivatives can be computed efficiently. Minimizi ...

Keywords: Stiefel manifold, blind source separation, canonical correlations, gram matrices, incomplete Cholesky decomposition, independent component analysis, integral equations, kernel methods, mutual information, semiparametric models

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Class/Subclass: **706/045.000**

Application Received: **02/18/2000**

Lost Case: **NO**

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Interference Number:

Issue Date: **12/04/2001**

Unmatched Petition: **NO**

Date of Abandonment: **00/00/0000**

<u>L&R Code:</u> Secrecy Code:1

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Third Level Review: **NO**   Secrecy Order: **NO**

Status: **150 /PATENTED CASE**

Status Date: **11/16/2001**

Confirmation Number: **7980**

Oral Hearing: **NO**

Title of Invention: **INFORMATION FILTERING METHOD AND APPARATUS FOR PREFERENTIALLY TAKING OUT INFORMATION HAVING A HIGH NECESSITY**

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Class/Subclass: **706/012.000**

Application Received: **09/04/1996**

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Patent Number: <u>**6076082**</u>

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Third Level Review: **NO**

Secrecy Order: **NO**

Status: **150 /PATENTED CASE**

Status Date: **05/26/2000**

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Similarity Metric Learning for a Variable-Kernel Classifier (1995) (Make Corrections) (51 citations)
David G. Lowe

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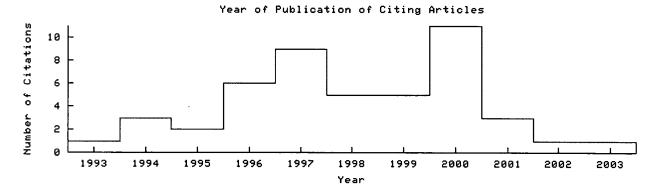
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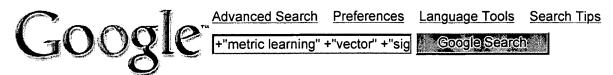
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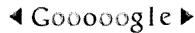
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... fl was determined so that the **signal** to noise ... with an adjustable (tuning) parameter
vector fi, and ... Similarity **metric learning** for a variable kernel classifier. ...
www.utstat.toronto.edu/reports/tibs/combine.ps - Similar pages

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Result Page: **Previous** 1 2 **3** 4 5   **Next**

| +"metric learning" +"vector" +"sig | Google Search | Search within results |

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Google™ [+"metric learning" +"vector" +"sig] [Google Search]

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Searched the web for **+"metric learning" +"vector" +"signal" +"matrix"** . Results **31 - 40** of about **86**. Search t

<u><html> <head> </head><body><pre> @incollection{AA01, author = ...</u>
... title = "Distance **Metric Learning** with Application to ... Programming in Support
Vector Machines", original ... Bistability Enhances **Signal** Processing in ...
books.nips.cc/nips15/nips15.bib - 101k - <u>Cached</u> - <u>Similar pages</u>

[PDF] <u>LNAI 2842 - Efficiently Learning the Metric with Side- ...</u>
File Format: PDF/Adobe Acrobat
... w Z ∈ R c to denote a weight **vector** in the c ... of eigenvectors used should depend
on the **signal** to noise ... where W is the **matrix** containing the k eigenvectors as ...
www.springerlink.com/index/Q1P2DAE1GCBLAUVK.pdf - <u>Similar pages</u>

[PS] <u>A Review and Empirical Evaluation</u>
File Format: Adobe PostScript - <u>View as Text</u>
... 29. Kohonen's (1990) learning **vector** quantization (LVQ) algorithm ... Similarity **metric**
learning for a variable-kernel ... on Acoustics Speech **Signal** Processing (42.5.1 ...
www.aic.nrl.navy.mil/papers/1996/AIC-96-006.ps - <u>Similar pages</u>

[PS] <u>Tubular neighbors for regression and classification</u>
File Format: Adobe PostScript - <u>View as Text</u>
... **vector** X. ? i. ... being tried, or perhaps there is too little **signal** in the ... Yianilos,
PN (1995), **Metric learning** via normal mixtures, Technical report, NEC Research ...
www-stat.stanford.edu/~owen/reports/note.ps - <u>Similar pages</u>

[PS] <u>Locally Weighted Learning Christopher G. Atkeson</u>
File Format: Adobe PostScript - <u>View as Text</u>
... h = jMj) or the magnitude of the **vector** m in ... requiring the determinant of the scaling
factor **matrix** to be ... similar reasons as are used in **signal** processing and ...
www.autonlab.org/autonweb/documents/ papers/atks:lcll.ps - <u>Similar pages</u>

[PS] <u>Machine Learning Research: Four Current Directions</u>
File Format: Adobe PostScript - <u>View as Text</u>
... A schema is a **vector** containing 0's, 1's, and ?'s. A ? in position j means ... or where
the model cannot easily be converted into a transition probability **matrix**. ...
www.cse.ucsc.edu/classes/cmps242/ Fall03/aimag-survey.ps - <u>Similar pages</u>

[PDF] <u>REPORT OF THE FINAL PANEL BOARD OF REGENTS SUPPORT FUND
RESEARCH ...</u>
File Format: PDF/Adobe Acrobat - <u>View as HTML</u>
... To address this issue, the following tasks will be pursued: (a) studies of flexible
metric learning algorithms for content-based image retrieval, with special ...
laregents.org/www2/forms/consultantrpts/ 2002reports/rcs.pdf - <u>Similar pages</u>

[PS] <u>set min duration, 131, 142 set mn weight, 85 set num res, 145 set ...</u>
File Format: Adobe PostScript - <u>View as Text</u>

... Similarity **metric learning** for a variable-kernel classifier ... the initialization of
the weight **vector** associated to ... instances and the whole weight **matrix** will be ...
sra.itc.it/projects/charade/rr50b.ps - <u>Similar pages</u>

[PS] <u>INFERENCE AND LEARNING IN COMPLEX STOCHASTIC PROCESSES</u>
File Format: Adobe PostScript - <u>View as Text</u>
... our approximation techniques can be used in para- **metric learning** to break ... above,
the computation reduces to straightforward **vector** and **matrix** operations. ...
robotics.stanford.edu/~xb/phdthesis/dissertation.ps - <u>Similar pages</u>

[PS] <u>3343 works that have been based on the Self-Organizing</u>
File Format: Adobe PostScript - <u>View as Text</u>
... application to a data **matrix** containing a-dna and b ... Image **vector** quantization using
ordered codebooks: Properties and applications ... **Signal** Processing, 40(1):87*103 ...
www.hku.nl/~pieter/EDU/neuro/doc/references.ps - <u>Similar pages</u>

*In order to show you the most relevant results, we have omitted some entries very similar to
the 40 already displayed.*
If you like, you can <u>repeat the search with the omitted results included</u>.

◀ Goooogle

Result Page: **Previous** <u>1</u> <u>2</u> <u>3</u> **4**

| +"metric learning" +"vector" +"sig | Google Search | Search within results |

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+"quantitative learning" +"vector"   ▓ Google Search ▓

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Searched the web for **+"quantitative learning" +"vector" +"signal" +"matrix"** . Results **1 - 6** of about **7**. Search

[PDF] **Learning curves for stochastic gradient descent in linear ...**
File Format: PDF/Adobe Acrobat - View as HTML
... We derive **quantitative learning** curves for three online training methods ... framework
with a single reward **signal**, which is ... each time step an input **vector** x with ...
books.nips.cc/papers/files/nips16/NIPS2003_LT17.pdf - Similar pages

[PDF] **Chapter 10. Learning**
File Format: PDF/Adobe Acrobat - View as HTML
... 10.7.3. **Quantitative Learning** Domain. ... we shall consider a process of forcing the
system to have a particular response to a specific input **signal** (action) by ...
www.passdrexel.com/files/ ecec490meystelnotesch10learningspring2003.pdf - Similar pages

[PS] **CONTENTS i Contents**
File Format: Adobe PostScript - View as Text
... V Vapnik Support **vector** networks 15/08/97 ... G Consonni Priors for **quantitative learning**
in probabilistic ... Niranjan Bayesian methods in **signal** processing problems ...
www.newton.cam.ac.uk/reports/9798/appendices.ps.gz - Similar pages

[PDF] **Technical Trading**
File Format: PDF/Adobe Acrobat - View as HTML
... That is, if prices indeed were martingales, **vector** autoregressions would produce
"trivial ... This will reduce the **matrix** to one possible response for each ...
www.e-m-h.org/RPFK95.pdf - Similar pages

[PDF] **Antonia J. Jones**
File Format: PDF/Adobe Acrobat
... 70 Figure 6-25 The control **signal** corresponding to the ... large (near one) when the input
vector is near ... enter the picture, or the **quantitative learning** rule that ...
www.cs.cf.ac.uk/user/Antonia.J.Jones/Lectures/EvolutionaryComputation/ EvolutionaryComputing.pdf - Similar
pages

[PS] **Causal Architecture, Complexity and Self-Organization in Time**
File Format: Adobe PostScript - View as Text
... a given **signal** is proportional to the negative logarithm of the probability of the
signal. ... method, each small region of the state-space had a **vector** field of ...
cscs.umich.edu/~crshalizi/thesis/ single-spaced-thesis.ps - Similar pages

*In order to show you the most relevant results, we have omitted some entries very similar to
the 6 already displayed.*
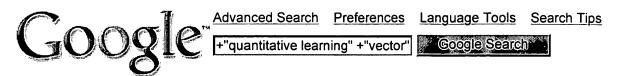*If you like, you can repeat the search with the omitted results included.*

+"quantitative learning" +"vector"   Google Search   Search within results

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L2 and probabil$6 and correlation	7

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US OCR Full-Text Database
EPO Abstracts Database
JPO Abstracts Database
Derwent World Patents Index
IBM Technical Disclosure Bulletins

Search:

L3

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[Recall Text] [Clear] [Interrupt]

Search History

DATE: Tuesday, December 30, 2003   Printable Copy   Create Case

Set Name	Query	Hit Count	Set Name
side by side			result set
	DB=PGPB,USPT,USOC,EPAB,JPAB,DWPI,TDBD; PLUR=NO; OP=OR		
L3	L2 and probabil$6 and correlation	7	L3
L2	L1 and metric and vector$2 and signal$2 and learn$4	32	L2
L1	706/25.ccls.	795	L1

END OF SEARCH HISTORY

Hit List

Search Results - Record(s) 1 through 7 of 7 returned.

☐ 1. Document ID: US 6009418 A

L3: Entry 1 of 7   File: USPT   Dec 28, 1999

US-PAT-NO: 6009418
DOCUMENT-IDENTIFIER: US 6009418 A

TITLE: Method and apparatus for neural networking using semantic attractor architecture

DATE-ISSUED: December 28, 1999

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Cooper; David L.	Fairfax	VA	22033	

US-CL-CURRENT: 706/15; 706/16, 706/25, 706/26, 706/27

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw De

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☐ 2. Document ID: US 5850470 A

L3: Entry 2 of 7   File: USPT   Dec 15, 1998

US-PAT-NO: 5850470
DOCUMENT-IDENTIFIER: US 5850470 A

TITLE: Neural network for locating and recognizing a deformable object

DATE-ISSUED: December 15, 1998

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Kung; Sun-Yuan	Princeton	NJ		
Lin; Shang-Hung	Princeton	NJ		
Lin; Long-Ji	Kendall Park	NJ		
Fang; Ming	Cranbury	NJ		

US-CL-CURRENT: 382/157; 382/116, 382/117, 382/118, 382/159, 706/20, 706/25

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw De

☐ 3. Document ID: US 5774632 A

L3: Entry 3 of 7   File: USPT   Jun 30, 1998

US-PAT-NO: 5774632
DOCUMENT-IDENTIFIER: US 5774632 A

TITLE: Method and device for the control of an autonomously exploring robot

DATE-ISSUED: June 30, 1998

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Kaske; Alexander	50933 Koln			DE

US-CL-CURRENT: 706/25; 700/253, 706/15

| Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw D |

☐ 4. Document ID: US 5621861 A

L3: Entry 4 of 7   File: USPT   Apr 15, 1997

US-PAT-NO: 5621861
DOCUMENT-IDENTIFIER: US 5621861 A

TITLE: Method of reducing amount of data required to achieve neural network
learning

DATE-ISSUED: April 15, 1997

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Hayashi; Masaaki	Yokohama			JP
Takahashi; Takumi	Yokohama			JP

US-CL-CURRENT: 706/25; 706/20

| Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw D |

☐ 5. Document ID: US 5568591 A

L3: Entry 5 of 7   File: USPT   Oct 22, 1996

US-PAT-NO: 5568591
DOCUMENT-IDENTIFIER: US 5568591 A

TITLE: Method and device using a neural network for classifying data

DATE-ISSUED: October 22, 1996

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Minot; Joel	Charenton			FR
Gentric; Philippe	Paris			FR

US-CL-CURRENT: 706/25; 706/20

| Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw De |

☐ 6.   Document ID: US 5455892 A

L3: Entry 6 of 7   File: USPT   Oct 3, 1995

US-PAT-NO: 5455892
DOCUMENT-IDENTIFIER: US 5455892 A

TITLE: Method for training a neural network for classifying an unknown signal with respect to known signals

DATE-ISSUED: October 3, 1995

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Minot; Joel	Charenton			FR
Gentric; Philippe	Paris			FR

US-CL-CURRENT: 706/25; 706/20

| Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw De |

☐ 7.   Document ID: US 5014219 A

L3: Entry 7 of 7   File: USPT   May 7, 1991

US-PAT-NO: 5014219
DOCUMENT-IDENTIFIER: US 5014219 A
** See image for Certificate of Correction **

TITLE: Mask controled neural networks

DATE-ISSUED: May 7, 1991

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
White; James A.	New Brighton	MN	55112	

US-CL-CURRENT: 706/25; 382/157

| Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw D... |

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Terms	Documents
L2 and probabil$6 and correlation	7

Display Format: [-] Change Format

Previous Page   Next Page   Go to Doc#

Refine Search

Search Results -

Terms	Documents
L1 and metric and vector$2 and signal$2 and learn$4 and probabil$6 and correlation and matrix	7

Database:
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US OCR Full-Text Database
EPO Abstracts Database
JPO Abstracts Database
Derwent World Patents Index
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Search: L4

Refine Search

Recall Text   Clear   Interrupt

Search History

DATE: Tuesday, December 30, 2003   Printable Copy   Create Case

Set Name side by side	Query	Hit Count	Set Name result set
	DB=PGPB, USPT, USOC, EPAB, JPAB, DWPI, TDBD; PLUR=NO; OP=OR		
L4	L1 and metric and vector$2 and signal$2 and learn$4 and probabil$6 and correlation and matrix	7	L4
L3	L2 and probabil$6 and correlation	7	L3
L2	L1 and metric and vector$2 and signal$2 and learn$4	32	L2
L1	706/25.ccls.	795	L1

END OF SEARCH HISTORY

Hit List

Search Results - Record(s) 1 through 7 of 7 returned.

□ 1. Document ID: US 6009418 A

L4: Entry 1 of 7   File: USPT   Dec 28, 1999

US-PAT-NO: 6009418
DOCUMENT-IDENTIFIER: US 6009418 A

TITLE: Method and apparatus for neural networking using semantic attractor architecture

DATE-ISSUED: December 28, 1999

INVENTOR-INFORMATION:
NAME	CITY	STATE	ZIP CODE	COUNTRY
Cooper; David L.	Fairfax	VA	22033	

US-CL-CURRENT: 706/15; 706/16, 706/25, 706/26, 706/27

| Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw De |

□ 2. Document ID: US 5850470 A

L4: Entry 2 of 7   File: USPT   Dec 15, 1998

US-PAT-NO: 5850470
DOCUMENT-IDENTIFIER: US 5850470 A

TITLE: Neural network for locating and recognizing a deformable object

DATE-ISSUED: December 15, 1998

INVENTOR-INFORMATION:
NAME	CITY	STATE	ZIP CODE	COUNTRY
Kung; Sun-Yuan	Princeton	NJ		
Lin; Shang-Hung	Princeton	NJ		
Lin; Long-Ji	Kendall Park	NJ		
Fang; Ming	Cranbury	NJ		

US-CL-CURRENT: 382/157; 382/116, 382/117, 382/118, 382/159, 706/20, 706/25

| Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw De |

☐ 3. Document ID: US 5774632 A

L4: Entry 3 of 7   File: USPT   Jun 30, 1998

US-PAT-NO: 5774632
DOCUMENT-IDENTIFIER: US 5774632 A

TITLE: Method and device for the control of an autonomously exploring robot

DATE-ISSUED: June 30, 1998

INVENTOR-INFORMATION:
NAME   CITY   STATE   ZIP CODE   COUNTRY
Kaske; Alexander   50933 Koln   DE

US-CL-CURRENT: 706/25; 700/253, 706/15

| Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw D |

☐ 4. Document ID: US 5621861 A

L4: Entry 4 of 7   File: USPT   Apr 15, 1997

US-PAT-NO: 5621861
DOCUMENT-IDENTIFIER: US 5621861 A

TITLE: Method of reducing amount of data required to achieve neural network
learning

DATE-ISSUED: April 15, 1997

INVENTOR-INFORMATION:
NAME   CITY   STATE   ZIP CODE   COUNTRY
Hayashi; Masaaki   Yokohama   JP
Takahashi; Takumi   Yokohama   JP

US-CL-CURRENT: 706/25; 706/20

| Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw D |

☐ 5. Document ID: US 5568591 A

L4: Entry 5 of 7   File: USPT   Oct 22, 1996

US-PAT-NO: 5568591
DOCUMENT-IDENTIFIER: US 5568591 A

TITLE: Method and device using a neural network for classifying data

DATE-ISSUED: October 22, 1996

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Minot; Joel	Charenton			FR
Gentric; Philippe	Paris			FR

US-CL-CURRENT: 706/25; 706/20

| Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw D |

☐ 6. Document ID: US 5455892 A

L4: Entry 6 of 7   File: USPT   Oct 3, 1995

US-PAT-NO: 5455892
DOCUMENT-IDENTIFIER: US 5455892 A

TITLE: Method for training a neural network for classifying an unknown signal with respect to known signals

DATE-ISSUED: October 3, 1995

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Minot; Joel	Charenton			FR
Gentric; Philippe	Paris			FR

US-CL-CURRENT: 706/25; 706/20

| Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw D |

☐ 7. Document ID: US 5014219 A

L4: Entry 7 of 7   File: USPT   May 7, 1991

US-PAT-NO: 5014219
DOCUMENT-IDENTIFIER: US 5014219 A
** See image for Certificate of Correction **

TITLE: Mask controled neural networks

DATE-ISSUED: May 7, 1991

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
White; James A.	New Brighton	MN	55112	

US-CL-CURRENT: 706/25; 382/157

| Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw D |

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Terms	Documents
L1 and metric and vector$2 and signal$2 and learn$4 and probabil$6 and correlation and matrix	7

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Previous Page   Next Page   Go to Doc#

Refine Search

Search Results -

Terms	Documents
L5 and keyword	29

Database:
```
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EPO Abstracts Database
JPO Abstracts Database
Derwent World Patents Index
IBM Technical Disclosure Bulletins
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Search: L6

[Refine Search]

[Recall Text ⬍]   [Clear]   [Interrupt]

Search History

DATE: Tuesday, December 30, 2003   Printable Copy   Create Case

Set Name side by side	Query	Hit Count	Set Name result set
DB=PGPB,USPT,USOC,EPAB,JPAB,DWPI,TDBD; PLUR=NO; OP=OR			
L6	L5 and keyword	29	L6
L5	metric and vector$2 and signal$2 and learn$4 and probabil$6 and correlation and matrix	240	L5
L4	L1 and metric and vector$2 and signal$2 and learn$4 and probabil$6 and correlation and matrix	7	L4
L3	L2 and probabil$6 and correlation	7	L3
L2	L1 and metric and vector$2 and signal$2 and learn$4	32	L2
L1	706/25.ccls.	795	L1

END OF SEARCH HISTORY

Hit List

Search Results - Record(s) 1 through 29 of 29 returned.

☐ 1.   Document ID: US 20030217047 A1

L6: Entry 1 of 29   File: PGPB   Nov 20, 2003

PGPUB-DOCUMENT-NUMBER: 20030217047
PGPUB-FILING-TYPE: new
DOCUMENT-IDENTIFIER: US 20030217047 A1

TITLE: Inverse inference engine for high performance web search

PUBLICATION-DATE: November 20, 2003

INVENTOR-INFORMATION:

NAME	CITY	STATE	COUNTRY	RULE-47
Marchisio, Giovanni B.	Kirkland	WA	US	

US-CL-CURRENT: 707/3

| Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Drawu Dε |

☐ 2.   Document ID: US 20030182246 A1

L6: Entry 2 of 29   File: PGPB   Sep 25, 2003

PGPUB-DOCUMENT-NUMBER: 20030182246
PGPUB-FILING-TYPE: new
DOCUMENT-IDENTIFIER: US 20030182246 A1

TITLE: Applications of fractal and/or chaotic techniques

PUBLICATION-DATE: September 25, 2003

INVENTOR-INFORMATION:

NAME	CITY	STATE	COUNTRY	RULE-47
Johnson, William Nevil Heaton	St. Peter Port		GB	
Blackledge, Jonathan Michael	Leicester		GB	
Murray, Bruce Lawrence John	Barcombe		GB	

US-CL-CURRENT: 705/76; 380/201, 380/278

| Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Drawu Dε |

☐ ·3.   Document ID: US 20030172043 A1

L6: Entry 3 of 29   File: PGPB   Sep 11, 2003

PGPUB-DOCUMENT-NUMBER: 20030172043
PGPUB-FILING-TYPE: new
DOCUMENT-IDENTIFIER: US 20030172043 A1

TITLE: Methods of identifying patterns in biological systems and uses thereof

PUBLICATION-DATE: September 11, 2003

INVENTOR-INFORMATION:

NAME	CITY	STATE	COUNTRY	RULE-47
Guyon, Isabelle	Berkeley	CA	US	
Weston, Jason	St. Leonard's on Sea		GB	

US-CL-CURRENT: 706/48

| Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw De |

☐ 4.   Document ID: US 20030037041 A1

L6: Entry 4 of 29   File: PGPB   Feb 20, 2003

PGPUB-DOCUMENT-NUMBER: 20030037041
PGPUB-FILING-TYPE: new
DOCUMENT-IDENTIFIER: US 20030037041 A1

TITLE: System for automatic determination of customized prices and promotions

PUBLICATION-DATE: February 20, 2003

INVENTOR-INFORMATION:

NAME	CITY	STATE	COUNTRY	RULE-47
Hertz, Frederick S. M.	Davis	WV	US	

US-CL-CURRENT: 707/1

| Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw De |

☐ 5.   Document ID: US 20020174120 A1

L6: Entry 5 of 29   File: PGPB   Nov 21, 2002

PGPUB-DOCUMENT-NUMBER: 20020174120
PGPUB-FILING-TYPE: new
DOCUMENT-IDENTIFIER: US 20020174120 A1

TITLE: Relevance maximizing, iteration minimizing, relevance-feedback, content-based image retrieval (CBIR)

PUBLICATION-DATE: November 21, 2002

INVENTOR-INFORMATION:

NAME	CITY	STATE	COUNTRY	RULE-47
Zhang, Hong-Jiang	Beijing		CN	
Su, Zhong	Beijing		CN	
Zhu, Xingquan	Shanghai		CN	

US-CL-CURRENT: 707/7

| Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw De |

☐ 6.   Document ID: US 20020156763 A1

L6: Entry 6 of 29   File: PGPB   Oct 24, 2002

PGPUB-DOCUMENT-NUMBER: 20020156763
PGPUB-FILING-TYPE: new
DOCUMENT-IDENTIFIER: US 20020156763 A1

TITLE: Extended functionality for an inverse inference engine based web search

PUBLICATION-DATE: October 24, 2002

INVENTOR-INFORMATION:

NAME	CITY	STATE	COUNTRY	RULE-47
Marchisio, Giovanni B.	Kirkland	WA	US	

US-CL-CURRENT: 707/1

| Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw De |

☐ 7.   Document ID: US 20020116196 A1

L6: Entry 7 of 29   File: PGPB   Aug 22, 2002

PGPUB-DOCUMENT-NUMBER: 20020116196
PGPUB-FILING-TYPE: new
DOCUMENT-IDENTIFIER: US 20020116196 A1

TITLE: Speech recognizer

PUBLICATION-DATE: August 22, 2002

INVENTOR-INFORMATION:

NAME	CITY	STATE	COUNTRY	RULE-47
Tran, Bao Q.	San Jose	CA	US	

US-CL-CURRENT: 704/270

`| Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw D‹`

☐ 8.   Document ID: US 20020099676 A1

L6: Entry 8 of 29   File: PGPB   Jul 25, 2002

PGPUB-DOCUMENT-NUMBER: 20020099676
PGPUB-FILING-TYPE: new
DOCUMENT-IDENTIFIER: US 20020099676 A1

TITLE: Method for filtering information including information data and keyword
attached thereto

PUBLICATION-DATE: July 25, 2002

INVENTOR-INFORMATION:

NAME	CITY	STATE	COUNTRY	RULE-47
Kindo, Toshiki	Yokohama		JP	

US-CL-CURRENT: 706/16

`| Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw D‹`

☐ 9.   Document ID: US 20020069218 A1

L6: Entry 9 of 29   File: PGPB   Jun 6, 2002

PGPUB-DOCUMENT-NUMBER: 20020069218
PGPUB-FILING-TYPE: new
DOCUMENT-IDENTIFIER: US 20020069218 A1

TITLE: System and method for indexing, searching, identifying, and editing portions
of electronic multimedia files

PUBLICATION-DATE: June 6, 2002

INVENTOR-INFORMATION:

NAME	CITY	STATE	COUNTRY	RULE-47
Sull, Sanghoon	Seoul		KR	
Kim, Hyeokman	Seoul		KR	
Choi, Hyungseok	Seoul		KR	
Chung, Min Gyo	Sungnam City		KR	
Yoon, Ja-Cheon	Seoul		KR	
Oh, Jeongtaek	Seoul		KR	
Lee, Sangwook	Seoul		KR	
Song, S. Moon-Ho	Seoul		KR	
Kim, Jung Rim	Seoul		KR	
Lee, Keansub	Suwon City		KR	

Chun, Seong Soo   Songnam City   KR
Oh, Sangwook   Cheju City   KR
Kim, Yunam   Cheju City   KR

US-CL-CURRENT: 715/501.1

Full	Title	Citation	Front	Review	Classification	Date	Reference	Sequences	Attachments	Claims	KWIC	Draw De

☐   10.   Document ID: US 20010047345 A1

L6: Entry 10 of 29   File: PGPB   Nov 29, 2001

PGPUB-DOCUMENT-NUMBER: 20010047345
PGPUB-FILING-TYPE: new
DOCUMENT-IDENTIFIER: US 20010047345 A1

TITLE: Information filtering method and apparatus for preferentially taking out
information having a high necessity

PUBLICATION-DATE: November 29, 2001

INVENTOR-INFORMATION:

NAME	CITY	STATE	COUNTRY	RULE-47
Kindo, Toshiki	Yokohama		JP	

US-CL-CURRENT: 706/12

Full	Title	Citation	Front	Review	Classification	Date	Reference	Sequences	Attachments	Claims	KWIC	Draw De

☐   11.   Document ID: US 6647378 B2

L6: Entry 11 of 29   File: USPT   Nov 11, 2003

US-PAT-NO: 6647378
DOCUMENT-IDENTIFIER: US 6647378 B2

TITLE: Information filtering method and apparatus for preferentially taking out
information having a high necessity

DATE-ISSUED: November 11, 2003

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Kindo; Toshiki	Yokohama			JP

US-CL-CURRENT: 706/21; 706/20

Full	Title	Citation	Front	Review	Classification	Date	Reference	Sequences	Attachments	Claims	KWIC	Draw De

☐   12.   Document ID: US 6633878 B1

L6: Entry 12 of 29   File: USPT   Oct 14, 2003

US-PAT-NO: 6633878
DOCUMENT-IDENTIFIER: US 6633878 B1

TITLE: Initializing an ecommerce database framework

DATE-ISSUED: October 14, 2003

INVENTOR-INFORMATION:
NAME   CITY   STATE   ZIP CODE   COUNTRY
Underwood; Roy Aaron   Long Grove   IL

US-CL-CURRENT: 707/100; 707/1, 707/102, 707/205

| Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw De |

☐   13.   Document ID: US 6609128 B1

L6: Entry 13 of 29   File: USPT   Aug 19, 2003

US-PAT-NO: 6609128
DOCUMENT-IDENTIFIER: US 6609128 B1

TITLE: Codes table framework design in an E-commerce architecture

DATE-ISSUED: August 19, 2003

INVENTOR-INFORMATION:
NAME   CITY   STATE   ZIP CODE   COUNTRY
Underwood; Roy Aaron   Long Grove   IL

US-CL-CURRENT: 707/10; 707/200

| Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw De |

☐   14.   Document ID: US 6601233 B1

L6: Entry 14 of 29   File: USPT   Jul 29, 2003

US-PAT-NO: 6601233
DOCUMENT-IDENTIFIER: US 6601233 B1

TITLE: Business components framework

DATE-ISSUED: July 29, 2003

INVENTOR-INFORMATION:
NAME   CITY   STATE   ZIP CODE   COUNTRY

Underwood; Roy Aaron   Long Grove   IL

US-CL-CURRENT: <u>717/102</u>; <u>717/100</u>, <u>717/101</u>, <u>717/103</u>, <u>717/104</u>, <u>717/106</u>, <u>717/107</u>

| Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw D |

□   15.   Document ID: US 6523027 B1

L6: Entry 15 of 29   File: USPT   Feb 18, 2003

US-PAT-NO: 6523027
DOCUMENT-IDENTIFIER: US 6523027 B1

TITLE: Interfacing servers in a Java based e-commerce architecture

DATE-ISSUED: February 18, 2003

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Underwood; Roy Aaron	Long Grove	IL		

US-CL-CURRENT: <u>707/4</u>; <u>707/10</u>, <u>707/100</u>

| Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw D |

□   16.   Document ID: US 6510406 B1

L6: Entry 16 of 29   File: USPT   Jan 21, 2003

US-PAT-NO: 6510406
DOCUMENT-IDENTIFIER: US 6510406 B1

TITLE: Inverse inference engine for high performance web search

DATE-ISSUED: January 21, 2003

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Marchisio; Giovanni B.	Kirkland	WA		

US-CL-CURRENT: <u>704/9</u>; <u>707/3</u>

| Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw D |

□   17.   Document ID: US 6460036 B1

L6: Entry 17 of 29   File: USPT   Oct 1, 2002

US-PAT-NO: 6460036

DOCUMENT-IDENTIFIER: US 6460036 B1

TITLE: System and method for providing customized electronic newspapers and target advertisements

DATE-ISSUED: October 1, 2002

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Herz; Frederick S. M.	Davis	WV		

US-CL-CURRENT: <u>707</u>/<u>10</u>; <u>705</u>/<u>14</u>, <u>707</u>/<u>2</u>, <u>709</u>/<u>217</u>, <u>725</u>/<u>14</u>

| Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw D |

☐ 18. Document ID: US 6341372 B1

L6: Entry 18 of 29   File: USPT   Jan 22, 2002

US-PAT-NO: 6341372
DOCUMENT-IDENTIFIER: US 6341372 B1

TITLE: Universal machine translator of arbitrary languages

DATE-ISSUED: January 22, 2002

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Datig; William E.	Centerport	NY	11721	

US-CL-CURRENT: <u>717</u>/<u>136</u>; <u>715</u>/<u>523</u>

| Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw D |

☐ 19. Document ID: US 6336108 B1

L6: Entry 19 of 29   File: USPT   Jan 1, 2002

US-PAT-NO: 6336108
DOCUMENT-IDENTIFIER: US 6336108 B1

TITLE: Speech recognition with mixtures of bayesian networks

DATE-ISSUED: January 1, 2002

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Thiesson; Bo	Woodinville	WA		
Meek; Christopher A.	Kirkland	WA		
Chickering; David Maxwell	Redmond	WA		

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Heckerman; David Earl          Bellevue          WA
Alleva; Fileno A.              Redmond           WA
Hwang; Mei-Yuh                 Redmond           WA
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US-CL-CURRENT: 706/20; 704/256

| Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw D |

☐ 20.   Document ID: US 6327583 B1

L6: Entry 20 of 29   File: USPT   Dec 4, 2001

US-PAT-NO: 6327583
DOCUMENT-IDENTIFIER: US 6327583 B1

TITLE: Information filtering method and apparatus for preferentially taking out
information having a high necessity

DATE-ISSUED: December 4, 2001

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Kindo; Toshiki	Yokohama			JP

US-CL-CURRENT: 706/45; 706/16, 706/21

| Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw D |

☐ 21.   Document ID: US 6286012 B1

L6: Entry 21 of 29   File: USPT   Sep 4, 2001

US-PAT-NO: 6286012
DOCUMENT-IDENTIFIER: US 6286012 B1

TITLE: Information filtering apparatus and information filtering method

DATE-ISSUED: September 4, 2001

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Kindo; Toshiki	Yokohama			JP
Yoshida; Hideyuki	Sagamihara			JP
Watanabe; Taisuke	Sagamihara			JP

US-CL-CURRENT: 707/104.1; 707/9, 709/218, 709/222

| Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw D |

☐ 22.   Document ID: US 6233545 B1

L6: Entry 22 of 29   File: USPT   May 15, 2001

US-PAT-NO: 6233545
DOCUMENT-IDENTIFIER: US 6233545 B1

TITLE: Universal machine translator of arbitrary languages utilizing epistemic
moments
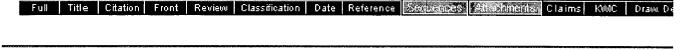
DATE-ISSUED: May 15, 2001

INVENTOR-INFORMATION:
NAME   CITY   STATE   ZIP CODE   COUNTRY
Datig; William E.   Centerport   NY   11721

US-CL-CURRENT: 704/2; 704/9, 706/62

| Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw De |

☐ 23.   Document ID: US 6076082 A

L6: Entry 23 of 29   File: USPT   Jun 13, 2000

US-PAT-NO: 6076082
DOCUMENT-IDENTIFIER: US 6076082 A

TITLE: Information filtering method and apparatus for preferentially taking out
information having a high necessity

DATE-ISSUED: June 13, 2000

INVENTOR-INFORMATION:
NAME   CITY   STATE   ZIP CODE   COUNTRY
Kindo; Toshiki   Yokohama   JP

US-CL-CURRENT: 706/12; 706/14, 707/6, 707/7

| Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw De |

☐ 24.   Document ID: US 6070140 A

L6: Entry 24 of 29   File: USPT   May 30, 2000

US-PAT-NO: 6070140
DOCUMENT-IDENTIFIER: US 6070140 A

TITLE: Speech recognizer

DATE-ISSUED: May 30, 2000

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Tran; Bao Q.	Houston	TX	77099	

US-CL-CURRENT: <u>704</u>/<u>275</u>; <u>704</u>/<u>232</u>

| Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw De |

☐ 25. Document ID: US 6029195 A

L6: Entry 25 of 29   File: USPT   Feb 22, 2000

US-PAT-NO: 6029195
DOCUMENT-IDENTIFIER: US 6029195 A

TITLE: System for customized electronic identification of desirable objects

DATE-ISSUED: February 22, 2000

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Herz; Frederick S. M.	Davis	WV	26260	

US-CL-CURRENT: <u>725</u>/<u>116</u>; <u>707</u>/<u>10</u>, <u>725</u>/<u>93</u>

| Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw De |

☐ 26. Document ID: US 5835087 A

L6: Entry 26 of 29   File: USPT   Nov 10, 1998

US-PAT-NO: 5835087
DOCUMENT-IDENTIFIER: US 5835087 A

TITLE: System for generation of object profiles for a system for customized
electronic identification of desirable objects

DATE-ISSUED: November 10, 1998

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Herz; Frederick S. M.	Davis	WV	26260	
Eisner; Jason M.	Philadelphia	PA	19107	
Ungar; Lyle H.	Philadelphia	PA	19103	

US-CL-CURRENT: <u>345</u>/<u>810</u>; <u>725</u>/<u>14</u>, <u>725</u>/<u>35</u>, <u>725</u>/<u>46</u>

| Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw De |

☐ 27. Document ID: US 5754939 A

L6: Entry 27 of 29   File: USPT   May 19, 1998

US-PAT-NO: 5754939
DOCUMENT-IDENTIFIER: US 5754939 A

TITLE: System for generation of user profiles for a system for customized electronic identification of desirable objects

DATE-ISSUED: May 19, 1998

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Herz; Frederick S. M.	Davis	WV	26260	
Eisner; Jason M.	Philadelphia	PA	19107	
Ungar; Lyle H.	Philadelphia	PA	19103	
Marcus; Mitchell P.	Philadelphia	PA	19119	

US-CL-CURRENT: 455/3.04; 709/219, 715/501.1, 725/34

| Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw De |

☐ 28. Document ID: US 5754938 A

L6: Entry 28 of 29   File: USPT   May 19, 1998

US-PAT-NO: 5754938
DOCUMENT-IDENTIFIER: US 5754938 A

TITLE: Pseudonymous server for system for customized electronic identification of desirable objects

DATE-ISSUED: May 19, 1998

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Herz; Frederick S. M.	Davis	WV	26260	
Eisner; Jason M.	Philadelphia	PA	19107	
Salganicoff; Marcos	Philadelphia	PA	19130	

US-CL-CURRENT: 725/116; 705/74, 707/6, 707/9, 709/219, 713/155, 725/1, 725/129, 725/25

| Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw De |

☐ 29. Document ID: US 5544256 A

L6: Entry 29 of 29   File: USPT   Aug 6, 1996

US-PAT-NO: 5544256
DOCUMENT-IDENTIFIER: US 5544256 A
** See image for <u>Certificate of Correction</u> **

TITLE: Automated defect classification system

DATE-ISSUED: August 6, 1996

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Brecher; Virginia H.	West Cornwall	CT		
Chou; Paul B.-L,	Montvale	NJ		
Hall; Robert W.	Jericho	VT		
Parisi; Debra M.	Carmel	NY		
Rao; Ravishankar	White Plains	NY		
Riley; Stuart L.	Colchester	VT		
Sturzenbecker; Martin C.	Carmel	NY		

US-CL-CURRENT: <u>382/149</u>; <u>382/159</u>, <u>706/900</u>

| Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw D |

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       (EPO's databases, available on stand-alone terminal in CPK2, 4B40)

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Yoshida, H.; Shida, T.; Kindo, T.;
Communications, Computers and signal Processing, 2001. PACRIM. 2001 IEEI Pacific Rim Conference on ,Volume: 1 , 26-28 Aug. 2001
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[Abstract] [PDF Full-Text (352KB)] **IEEE CNF**

2 **A newspaper reading out system with an adaptive information filtei technology to support visually impaired people**
Yoshida, H.; Kindo, T.;
Communications, Computers and Signal Processing, 1999 IEEE Pacific Rim Conference on , 22-24 Aug. 1999
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[Abstract] [PDF Full-Text (360KB)] **IEEE CNF**

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Meki, Y.; Kindo, T.; Kurokawa, H.; Sasase, I.;
Communications, Computers and Signal Processing, 1997. '10 Years PACRIM 1997 - Networking the Pacific Rim'. 1997 IEEE Pacific Rim Conference on ,Vo 2 , 20-22 Aug. 1997
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1 **A DCT-based adaptive metric learning model using asymptotic local
information measure**
Satonaka, T.; Baba, T.; Chikamura, T.; Otsuki, T.; Meng, T.H.;
Neural Networks for Signal Processing [1997] VII. Proceedings of the 1997 IE
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[Abstract]   [PDF Full-Text (416 KB)]   **IEEE CNF**

2 **Distance-from-boundary as a metric for texture image retrieval**
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Acoustics, Speech, and Signal Processing, 2001. Proceedings. (ICASSP '01).
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3 **Contravariant adaptation on structured parameter spaces**
Moon, T.K.; Gunther, J.;
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4 **An adaptive metric learning procedure for rec nfigurable facial sign
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Satonaka, T.; Otsuki, T.; Chikamura, T.;
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Pages:409 - 418

[Abstract]   [PDF Full-Text (380 KB)]   **IEEE CNF**

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5 **Neural Netw rks f r Signal Pr cessing VII. Pr ceedings f the 199**7 **Signal Processing Society Workshop**

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[Abstract]   [PDF Full-Text (280 KB)]   **IEEE CNF**

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6 **Discriminative metric design for pattern recognition**
Watanabe, H.; Yamaguchi, T.; Katagiri, S.;
Acoustics, Speech, and Signal Processing, 1995. ICASSP-95., 1995 Internatio Conference on , Volume: 5 , 9-12 May 1995
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[Abstract]   [PDF Full-Text (348 KB)]   **IEEE CNF**

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7 **A neural network for unsupervised categorization of multivalued in**| **patterns: an application to satellite image clustering**
Baraldi, A.; Parmiggiani, F.;
Geoscience and Remote Sensing, IEEE Transactions on , Volume: 33 , Issue: 2 , March 1995
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1 Prior knowledge and preferential structures in gradient descent learning algorithms   ■
Robert E. Mahony, Robert C. Williamson
September 2001 **The Journal of Machine Learning Research**, Volume 1

Full text available: 🗎 pdf(539.02 KB)   Additional Information: full citation, abstract

A family of gradient descent algorithms for learning linear functions in an online setting is considered. The family includes the classical LMS algorithm as well as new variants such as the Exponentiated Gradient (EG) algorithm due to Kivinen and Warmuth. The algorithms are based on prior distributions defined on the weight space. Techniques from differential geometry are used to develop the algorithms as gradient descent iterations with respect to the natural gradient in the Riemannian structur ...

2 Surveillance: Multi-camera spatio-temporal fusion and biased sequence-data learning   ■
for security surveillance
Gang Wu, Yi Wu, Long Jiao, Yuan-Fang Wang, Edward Y. Chang
November 2003 **Proceedings of the eleventh ACM international conference on Multimedia**

Full text available: 🗎 pdf(281.72 KB)   Additional Information: full citation, abstract, references, index terms

We present a framework for multi-camera video surveillance. The framework consists of three phases: *detection*, *representation*, and *recognition*. The *detection* phase handles multi-source spatio-temporal data fusion for efficiently and reliably extracting motion trajectories from video. The *representation* phase summarizes raw trajectory data to construct hierarchical, invariant, and content-rich descriptions of the motion events. Finally, the *recognition* ph ...

3 A theory for memory-based learning   ■
Jyh-Han Lin, Jeffrey Scott Vitter
July 1992 **Proceedings of the fifth annual workshop on Computational learning theory**

Full text available: 🗎 pdf(1.24 MB)   Additional Information: full citation, abstract, references, citings, index terms

A memory-based learning system is an extended memory management system that decomposes the input space either statically or dynamically into subregions for the purpose of storing and retrieving functional information. The main generalization techniques employed by memory-based learning systems are the nearest-neighbor search, space decomposition techniques, and clustering. Research on memory-based learning is still in its early stage. In particular, there are very few rigorous theoretical r ...

4 Session 9: image indexing and retrieval: DynDex: a dynamic and non-metric space indexer

King-Shy Goh, Beitao Li, Edward Chang

December 2002 **Proceedings of the tenth ACM international conference on Multimedia**

Full text available: pdf(648.47 KB)   Additional Information: full citation, abstract, references, citings

> To date, almost all research work in the Content-Based Image Retrieval (CBIR) community has used Minkowski-like functions to measure similarity between images. In this paper, we first present a non-metric distance function, dynamic partial function (DPF), which works significantly better than Minkowski-like functions for measuring perceptual similarity; and we explain DPF's link to similarity theories in cognitive science. We then propose DynDex, an indexing method that deals with both the dynam ...

> **Keywords**: high-dimensional index, non-metric distance function, similarity search

5 Supervised adaptive resonance networks

R. S. Baxter

May 1991 **Proceedings of the conference on Analysis of neural network applications**

Full text available: pdf(1.44 MB)   Additional Information: full citation, references, index terms

6 Clustered principal components for precomputed radiance transfer

Peter-Pike Sloan, Jesse Hall, John Hart, John Snyder

July 2003 **ACM Transactions on Graphics (TOG)**, Volume 22 Issue 3

Full text available: pdf(9.29 MB)   Additional Information: full citation, abstract, references

> We compress storage and accelerate performance of precomputed radiance transfer (PRT), which captures the way an object shadows, scatters, and reflects light. PRT records over many surface points a transfer matrix. At run-time, this matrix transforms a vector of spherical harmonic coefficients representing distant, low-frequency source lighting into exiting radiance. Per-point transfer matrices form a high-dimensional surface signal that we compress using *clustered principal component analysi* ...

> **Keywords**: *graphics hardware, illumination, monte carlo techniques, rendering, shadow algorithms*

7 Finknn: a fuzzy interval number k-nearest neighbor classifier for prediction of sugar production from populations of samples

Vassilios Petridis, Vassilis G. Kaburlasos

September 2003 **The Journal of Machine Learning Research**, Volume 4

Full text available: pdf(360.76 KB)   Additional Information: full citation, abstract

> This work introduces *FINkNN*, a k-nearest-neighbor classifier operating over the metric lattice of conventional interval-supported convex fuzzy sets. We show that for problems involving populations of measurements, data can be represented by fuzzy interval numbers (FINs) and we present an algorithm for constructing FINs from such populations. We then present a lattice-theoretic metric distance between FINs with arbitrary-shaped membership functions, which forms the basis for *FINkNN'* ...

8 Multimedia communications, relevance feedback and indexing: Kernel VA-files for relevance feedback retrieva

Douglas R. Heisterkamp, Jing Peng
November 2003 **Proceedings f the first ACM international workshop n Multimedia databases**
Full text available: pdf(453.37 KB)   Additional Information: <u>full citation</u>, <u>abstract</u>, <u>references</u>, <u>index terms</u>

Many data partitioning index methods perform poorly in high dimensional space and do not support relevance feedback retrieval. The vector approximation file (VA-File) approach overcomes some of the difficulties of high dimensional vector spaces, but cannot be applied to relevance feedback retrieval using kernel distances in the data measurement space. This paper introduces a novel KVA-File (kernel VA-File) that extends VA-File to kernel-based retrieval methods. A key observation is that kernel d ...

Keywords: VA-Files flexible metrics, content-based image retrieval, indexing, kernel methods, relevance feedback

9 <u>An observability-based code coverage metric for functional simulation</u>
Srinivas Devadas, Abhijit Ghosh, Kurt Keutzer
January 1997 **Proceedings of the 1996 IEEE/ACM international conference on Computer-aided design**
Full text available: pdf(124.26 KB)   Additional Information: <u>full citation</u>, <u>abstract</u>, <u>references</u>, <u>citings</u>, <u>index terms</u>
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Functional simulation is the most widely used method for design verification. At various levels of abstraction, e.g., behavioral, register-transfer level and gate level, the designer simulates the design using a large number of vectors attempting to debug and verify the design. A major problem with functional simulation is the lack of good metrics and tools to evaluate the quality of a set of functional vectors. Metrics used currently are based on instruction counts and are quite simplistic. Des ...

Keywords: verification, functional simulation, code coverage

10 <u>On the influence of the kernel on the consistency of support vector machines</u>
Ingo Steinwart
March 2002 **The Journal of Machine Learning Research**, Volume 2
Full text available: pdf(343.65 KB)   Additional Information: <u>full citation</u>, <u>abstract</u>, <u>references</u>, <u>citings</u>, <u>index terms</u>

In this article we study the generalization abilities of several classifiers of support vector machine (SVM) type using a certain class of kernels that we call universal. It is shown that the soft margin algorithms with universal kernels are consistent for a large class of classification problems including some kind of noisy tasks provided that the regularization parameter is chosen well. In particular we derive a simple sufficient condition for this parameter in the case of Gaussian RBF kernels ...

Keywords: PAC model, computational learning theory, kernel methods, pattern recognition, support vector machines

11 <u>A survey on wavelet applications in data mining</u>
Tao Li, Qi Li, Shenghuo Zhu, Mitsunori Ogihara
December 2002 **ACM SIGKDD Explorati ns Newsletter**, Volume 4 Issue 2
Full text available: pdf(330.06 KB)   Additional Information: <u>full citation</u>, <u>abstract</u>, <u>references</u>

Recently there has been significant development in the use of wavelet methods in various data mining processes. However, there has been written no comprehensive survey available

on the topic. The goal of this is paper to fill the void. First, the paper presents a high-level data-mining framework that reduces the overall process into smaller components. Then applications of wavelets for each component are reviewd. The paper concludes by discussing the impact of wavelets on data mining research an ...

12 Special issue on special feature: An extensive empirical study of feature selection metrics for text classification

George Forman
March 2003 **The Journal of Machine Learning Research**, Volume 3

Full text available: pdf(270.38 KB)   Additional Information: full citation, abstract

Machine learning for text classification is the cornerstone of document categorization, news filtering, document routing, and personalization. In text domains, effective feature selection is essential to make the learning task efficient and more accurate. This paper presents an empirical comparison of twelve feature selection methods (e.g. Information Gain) evaluated on a benchmark of 229 text classification problem instances that were gathered from Reuters, TREC, OHSUMED, etc. The results are a ...

13 Survey articles: Data mining for hypertext: a tutorial survey

Soumen Chakrabarti
January 2000 **ACM SIGKDD Explorations Newsletter**, Volume 1 Issue 2

Full text available: pdf(1.19 MB)   Additional Information: full citation, abstract, references, citings

With over 800 million pages covering most areas of human endeavor, the World-wide Web is a fertile ground for data mining research to make a difference to the effectiveness of information search. Today, Web surfers access the Web through two dominant interfaces: clicking on hyperlinks and searching via keyword queries. This process is often tentative and unsatisfactory. Better support is needed for expressing one's information need and dealing with a search result in more structured ways than av ...

14 Session 9: image indexing and retrieval: An effective region-based image retrieval framework

Feng Jing, Mingjing Li, Hong-Jiang Zhang, Bo Zhang
December 2002 **Proceedings of the tenth ACM international conference on Multimedia**

Full text available: pdf(216.67 KB)   Additional Information: full citation, abstract, references

We present a region-based image retrieval framework that integrates efficient region-based representation in terms of storage and retrieval and effective on-line learning capability. The framework consists of methods for image segmentation and grouping, indexing using modified inverted file, relevance feedback, and continuous learning. By exploiting a vector quantization method, a compact region-based image representation is achieved. Based on this representation, an indexing scheme similar to t ...

Keywords: continuous learning, inverted file, region-based image retrieval, relevance feedback

15 Intelligent signal analysis and recognition using a self-organizing database

R. Levinson, D. Helman, E. Oswalt
June 1988 **Proceedings of the first internati nal conference on Industrial and engineering applications of artificial intelligence and expert systems - V lume 2**

Full text available: pdf(1.20 MB)   Additional Information: full citation, references, index terms

16 Technique for automatically correcting words in text

Karen Kukich

December 1992 **ACM Computing Surveys (CSUR)**, Volume 24 Issue 4

Full text available: pdf(6.23 MB)   Additional Information: full citation, abstract, references, citings, index terms, review

Research aimed at correcting words in text has focused on three progressively more difficult problems:(1) nonword error detection; (2) isolated-word error correction; and (3) context-dependent work correction. In response to the first problem, efficient pattern-matching and n-gram analysis techniques have been developed for detecting strings that do not appear in a given word list. In response to the second problem, a variety of general and application-specific spelling cor ...

Keywords: n-gram analysis, Optical Character Recognition (OCR), context-dependent spelling correction, grammar checking, natural-language-processing models, neural net classifiers, spell checking, spelling error detection, spelling error patterns, statistical-language models, word recognition and correction

17 Searching in metric spaces

Edgar Chávez, Gonzalo Navarro, Ricardo Baeza-Yates, José Luis Marroquín

September 2001 **ACM Computing Surveys (CSUR)**, Volume 33 Issue 3

Full text available: pdf(916.04 KB)   Additional Information: full citation, abstract, references, citings, index terms

The problem of searching the elements of a set that are close to a given query element under some similarity criterion has a vast number of applications in many branches of computer science, from pattern recognition to textual and multimedia information retrieval. We are interested in the rather general case where the similarity criterion defines a metric space, instead of the more restricted case of a vector space. Many solutions have been proposed in different areas, in many cases without cros ...

Keywords: Curse of dimensionality, nearest neighbors, similarity searching, vector spaces

18 Routing: Network routing with path vector protocols: theory and applications

João Luis Sobrinho

August 2003 **Proceedings of the 2003 conference on Applications, technologies, architectures, and protocols for computer communications**

Full text available: pdf(266.53 KB)   Additional Information: full citation, abstract, references, index terms

Path vector protocols are currently in the limelight, mainly because the inter-domain routing protocol of the Internet, BGP (Border Gateway Protocol), belongs to this class. In this paper, we cast the operation of path vector protocols into a broad algebraic framework and relate the convergence of the protocol, and the characteristics of the paths to which it converges, with the monotonicity and isotonicity properties of its path compositional operation. Here, monotonicity means that the weight ...

Keywords: BGP, algebra, border gateway protocol, path vector protocols

19 Face recognition: A literature survey

W. Zhao, R. Chellappa, P. J. Phillips, A. Rosenfeld

December 2003 **ACM Computing Surveys (CSUR)**, Volume 35 Issue 4

Full text available: pdf(4.28 MB)   Additional Information: full citation, abstract, references, index terms

As one of the most successful applications of image analysis and understanding, face

recognition has recently received significant attention, especially during the past several years. At least two reasons account for this trend: the first is the wide range of commercial and law enforcement applications, and the second is the availability of feasible technologies after 30 years of research. Even though current machine recognition systems have reached a certain level of maturity, their success is ...

Keywords: Face recognition, person identification

20 Think globally, fit locally: unsupervised learning of low dimensional manifolds

Lawrence K. Saul, Sam T. Roweis
September 2003 **The Journal of Machine Learning Research**, Volume 4

Full text available: pdf(2.91 MB)   Additional Information: full citation, abstract

The problem of dimensionality reduction arises in many fields of information processing, including machine learning, data compression, scientific visualization, pattern recognition, and neural computation. Here we describe locally linear embedding (LLE), an unsupervised learning algorithm that computes low dimensional, neighborhood preserving embeddings of high dimensional data. The data, assumed to be sampled from an underlying manifold, are mapped into a single global coordinate system of lowe ...

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A theory for memory-based learning

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Proceedings of the fifth annual workshop on Computational learning theory table of contents
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Pages: 103 - 115
Year of Publication: 1992
ISBN:0-89791-497-X

Authors   Jyh-Han Lin
Jeffrey Scott Vitter

Sponsors   SIGACT: ACM Special Interest Group on Algorithms and Computation Theory
SIGART: ACM Special Interest Group on Artificial Intelligence

Publisher   ACM Press   New York, NY, USA

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↑ INDEX TERMS

Primary Classification:
 I. Computing Methodologies
  ↳ **I.2** ARTIFICIAL INTELLIGENCE

Additional Classification:
 E. Data
  ↳ **E.4** CODING AND INFORMATION THEORY
   ↳ **Subjects:** Data compaction and compression

 I. Computing Methodologies
  ↳ **I.5** PATTERN RECOGNITION

General Terms:
Algorithms, Theory, Verification

↑ Collaborative Colleagues:

Jyh-Han Lin:	Jeffrey Scott Vitter			
Jeffrey Scott Vitter:	James M. Abello	Michael T. Goodrich	Philip M. Long	John T. Stasko
	Pankaj K. Agarwal	Roberto Grossi	Yossi Matias	Sairam Subramanian
	Ramesh Agarwal	Edward F. Grove	Peter Bro Miltersen	Torsten Suel
	Ramesh C. Agarwal	Leonidas J. Guibas	T. M. Murali	Roberto Tamassia
	Alok Aggarwal	Ankur Gupta	Apostol Natsev	Ioannis G. Tollis
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	Lars Arge	Klaus Hinrichs	Wen-Chun Ni	Christopher J. Van Wyk
	Rakesh Barve	Dzung T. Hoang	Mark H. Nodine	Kasturi R. Varadarajan
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Wen-Chin Chen	Ming-Yang Kao	Sridhar	Min Wang
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Up

Metric Learning via Normal Mixtures

Peter N. Yianilos

Abstract: Natural learners rarely have access to perfectly labeled data - motivating the study of unsupervised learning in an attempt to assign labels. An alternative viewpoint, which avoids the issue of labels entirely, has as the learner's goal the discovery of an effective metric with which similarity judgments can be made. We refer to this paradigm as {\em metric learning}. Effective classification, for example, then becomes a consequence rather than the direct purpose of learning.

Consider the following setting: a database made up of exactly one observation of each of many different objects. This paper shows that, under admittedly strong assumptions, there exists a natural prescription for metric learning in this data starved case.

Our outlook is stochastic, and the metric we learn is represented by a joint probability density estimated from the observed data. We derive a closed-form expression for the value of this density starting from an explanation of the data as a Gaussian Mixture. Our framework places two known classification techniques of statistical pattern recognition at opposite ends of a spectrum - and describes new intermediate possibilities. The notion of a *stochastic equivalence predicate* is introduced and striking differences between its behavior and that of conventional metrics are illuminated. As a result one of the basic tenets of nearest-neighbor-based classification is challenged.
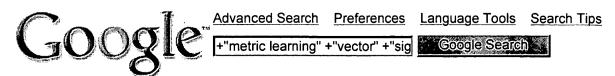
Keywords: Nearest Neighbor Search, Metric Learning, Normal/Gaussian Mixture Densities, Unsupervised Learning, Neural Network, Encoder Network.

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- See also:
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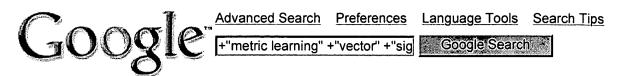
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